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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,855	04/09/2004	Min-Lung Huang	HUAN3262/EM	8687
23364	7590	04/11/2006	EXAMINER	
BACON & THOMAS, PLLC 625 SLATERS LANE FOURTH FLOOR ALEXANDRIA, VA 22314			BLUM, DAVID S	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 04/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/820,855

Applicant(s)

HUANG, MIN-LUNG

Examiner

David S. Blum

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

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This is in response to the application filed 4/9/04.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 17 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for 50-80 microns, does not reasonably provide enablement for at least larger than 50 microns. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to enable the invention commensurate in scope with these claims. At least larger than 50 microns is open ended and allows for any size above 50 microns. The examiner finds this un-enabling because there would be a thickness at which the layer is too thick to complete the structure successfully. As there are no defined metes and bounds of the range, the claim is not enabled for the full range of the limitation.

Claim Objections

3. Claim 6 is objected to because of the following informalities: Claim 6 limits the wetting layer to titanium. The instant specification does not teach this. the instant specification teaches titanium as the adhesive layer. On page 6, the instant specification

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teaches that the adhesive layer, first barrier layer and wetting layer comprise...(the list recites titanium and several other materials.). although one could argue that page 6 then teaches titanium as the wetting layer, the recitation also reads on titanium being the adhesive layer in the group and another material being the wetting layer. Further, titanium is commonly used as an adhesive layer, but not at a wetting layer. Clarification and appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 8-13, 15-16, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu (US 006744142B2).

The Liu teaches the structure of claims 8-13, 15-16, and 19, except for explicitly teaching the surface has an active layer.

Regarding claim 8, Liu does not teach an active surface. However, Liu teaches an electrical connection to the surface, thus an active surface is implied. Liu (column 1 line 60) teaches a plurality of bonding pads on the surface. Liu teaches a first electrically

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conductive layer (206b) and a second electrically conductive layer (218) of tin-nickel (column 4 line 65-column 5 line 3).

Regarding claim 9, a plurality of bumps formed above the bonding pads are attached to the second conductive layer (column 1 lines 57-67).

Regarding claim 10, the second electrically conductive layer is extended above the active surface (figure 4).

Regarding claim 11, a dielectric layer (214) covers the second conductive layer and exposed a portion of the second conductive layer from a redistributed pad (figure 4). That the pad is redistributed is given no patentable weight. The structure need only have a pad.

Regarding claim 12, the bump is formed on the redistributed pad (figure 4). That the pad is redistributed is given no patentable weight. The structure need only have a pad.

Regarding claim 13, the first electrically conductive layer is nickel (column 4 line 65).

Regarding claim 15, the dielectric layer comprises a polyimide (column 5 lines 6-7).

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Regarding claim 16, the quantity of tin is smaller than the quantity of nickel (column 5 line 3, Ni₆Sn₅).

Regarding claim 19, the dielectric layer is a polymer (polyimide 214) is a polymer.

6. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (pages 1-3) in view of Liu (US 006744142B2).

The admitted prior art on pages 1-3 teach the structure of claims 1-5, except for the second barrier layer disposed upon the wetting layer.

Regarding claim 1, the admitted prior art (APA) teaches an adhesive layer (106a) on the bonding pad (104), a first barrier layer (106b) on the adhesive layer, and a wetting layer (106c) on the first barrier layer. The admitted prior art does not teach or suggest a second barrier layer on the wetting layer. Liu teaches forming a barrier layer (218) of tin and nickel on the wetting layer (206b) to prevent spalling of the UBM layer (column 3 lines 6-10).

Regarding claim 2, the quantity of tin is smaller than the quantity of nickel (Ni₆Sn₅, column 3 line 7).

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Regarding claim 3, the first barrier layer is a nickel-vanadium layer (APA, paragraph 0005).

Regarding claim 4, the wetting layer is a copper layer (APA, paragraph 0005).

Regarding claim 5, the wetting layer is a nickel layer (Liu, column 4 line 20, 206b). It is noted that the instant specification teaches a plurality of materials for the wetting layer, but does not teach any criticality between them.

Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or of any unexpected results arising there from. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in the claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1515, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

It would be obvious to one skilled in the requisite art at the time of the invention to modify the admitted prior art by forming a barrier layer (206b) of tin and nickel on the wetting layer (206a) as taught by Liu to prevent spalling of the UBM layer (column 3 lines 6-10).

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Liu (US 006744142B2) in view of Tong (US 2003/0189260A1).

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Liu teaches the structure of claim 14 as recited above in regard to claim 8, except for alternatives for the first conductive layer.

Regarding claim 14, Liu teaches a first conductive layer of nickel. Tong teaches using titanium, a titanium-tungsten alloy. It is noted that the instant specification teaches a plurality of materials for the first conductive layer, but does not teach any criticality between them.

Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or of any unexpected results arising there from. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in the claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1515, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

It would be obvious to one skilled in the requisite art at the time of the invention to modify Liu by using other alternatives for the first conductive layer as taught by Tong to be known materials for this usage. One skilled in the requisite art would use known materials rather than spend research time and money to find new materials when the known materials provide adequate results.

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8. Claims 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (pages 1-3) in view of Liu (US 006744142B2) and in further view of Wang (US006782897B2).

The admitted prior art on pages 1-3 and Liu teach the structure of claims 6-7 as recited above in regard to claim 1, except for the wetting material being titanium and the thickness of the second barrier layer.

Regarding claim 6, the instant specification actually teaches titanium to be the adhesive layer, or (page 6), the adhesive, barrier, and wetting layers comprise titanium, etc. the examiner believes that the specification means that titanium is one of the three layers, and in fact the adhesive layer. In this light, Wang teaches the material may be titanium, with layers of nickel, vanadium, or alloys thereof (column 4 lines 60-67).

Regarding claim 7, the second barrier layer is about 50-80 microns thick. It is noted that Liu (column 4 lines 20-23) teaches the entire thickness of the UBM layers to be for example 2000 angstroms (0.2 microns) and Wang (column 4 line 55) teaches the layers to be between 500-5000 angstroms (0.05- 0.5 microns). Although the layer as claimed is approximately 100 times the thickness of the cited references, the examiner believes that the range is one of mere optimization.

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These ranges are considered to involve routine optimization while it has been held to be within the level of ordinary skill in the art. As noted in *In re Aller* (105 USPQ233), the selection of reaction parameters such as temperature and concentration would have been obvious:

"Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art. Such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

In re Aller 105 USPQ233, 255 (CCPA 1955). See also *In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re Irmischer* 66 USPQ 314 (CCPA 1945); *In re Norman* 66 USPQ 308 (CCPA 1945); *In re Swenson* 56 USPQ 372 (CCPA 1942); *In re Sola* 25 USPQ 433 (CCPA 1935); *In re Dreyfus* 24 USPQ 52 (CCPA 1934).

One skilled in the requisite art at the time of the invention would have used any ranges or exact figures suitable to the method in the structure of a UBM regarding dimensions using prior knowledge, experimentation, and observation with the apparatus used in order to optimize the process and produce the UBM structure desired to the parameters desired.

It would be obvious to one skilled in the requisite art at the time of the invention to modify Liu by using titanium as the wetting (adhesive/wetting) layer. One skilled in the requisite art would use known materials rather than spend research time and money to find new materials when the known materials provide adequate results.

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9. Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu (US 006744142B2) and in view of Wang (US006782897B2).

Liu teaches the structure of claims 17-18 as recited above in regard to claim 8, except for the thickness of the second barrier layer and the material of the dielectric layer.

Regarding claim 17, the second barrier layer is at least larger than 50 microns thick. It is noted that Liu (column 4 lines 20-23) teaches the entire thickness of the UBM layers to be for example 2000 angstroms (0.2 microns) and Wang (column 4 line 55) teaches the layers to be between 500-5000 angstroms (0.05- 0.5 microns). Although the layer as claimed is approximately 100 times the thickness of the cited references, the examiner believes that the range is one of mere optimization.

These ranges are considered to involve routine optimization while it has been held to be within the level of ordinary skill in the art. As noted in *In re Aller* (105 USPQ233), the selection of reaction parameters such as temperature and concentration would have been obvious:

"Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art. Such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

In re Aller 105 USPQ233, 255 (CCPA 1955). See also *In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re Irmscher* 66 USPQ

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314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

One skilled in the requisite art at the time of the invention would have used any ranges or exact figures suitable to the method in the structure of a UBM regarding dimensions using prior knowledge, experimentation, and observation with the apparatus used in order to optimize the process and produce the UBM structure desired to the parameters desired.

Regarding claim 18, Liu is silent as to the material of the dielectric other than it being a polyimide. Wang teaches the material to be a polyimide, and as an example lists Benzocyclobutene (BCD).

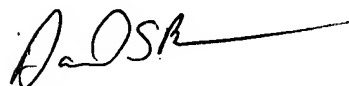
It would be obvious to one skilled in the requisite art at the time of the invention to modify Liu by using BCD as the dielectric layer. One skilled in the requisite art would use known materials rather than spend research time and money to find new materials when the known materials provide adequate results.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Blum whose telephone number is (571)-272-1687) and e-mail address is David.blum@USPTO.gov .

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr., can be reached at (571)-272-1702. Our facsimile number all patent correspondence to be entered into an application is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'D. S. Blum', with a long horizontal stroke extending to the right.

David S. Blum

April 10, 2006